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## SARDAR PATEL UNIVERSITY

M.Sc. (Polymer Science &amp; Technology) Semester-III Examination-2017

Thursday, 2<sup>nd</sup> November-2017

2:00 P.M. to 5:00 P.M.

## PS03CPST08: RUBBER TECHNOLOGY

Total Marks: 70

- Note: (1) Attempt all questions.  
(2) Figures to the right indicate marks.

**Q. 1** Answer the following multiple choice questions. 08

- (1) Rubber is highly impermeable to \_\_\_\_\_.  
(i) water (ii) air (iii) both 1 & 2 (iv) none of above.
- (2) CSM is the \_\_\_\_\_ modification of PE.  
(i) physical (ii) chemical (iii) both 1 & 2 (iv) none of above.
- (3) The top layer works as a \_\_\_\_\_ layer in hose.  
(i) cover (ii) protective (iii) packing (iv) none of above.
- (4) \_\_\_\_\_ mol % of non conjugated diene is added in EPDM synthesis.  
(i) 1.0 (ii) 2.0 (iii) 1.5 (iv) 2.5
- (5) Thiurium sulphide used as a \_\_\_\_\_ agent.  
(i) pigment (ii) vulcanizing agent (iii) antioxidant (iv) accelerators
- (6) 1, 2 – insertion in PB forms a chiral carbon attached to the \_\_\_\_\_ vinyl group.  
(i) main (ii) pendent (iii) both 1 & 2 (iv) chain.
- (7) Carbon black produced by \_\_\_\_\_ burning of hydrocarbon.  
(i) complete (ii) incomplete (iii) average (iv) none of above.
- (8) The major compounding ingredient is \_\_\_\_\_ in rubber compounding.  
(i) filler (ii) antidegradent (iii) pigment (iv) plasticizer.

**Q. 2** Attempt **any seven** of the following. 14

- (1) How is levulinic aldehyde formed from rubber hydrocarbon?
- (2) Explain in detail about chlorinated rubber.
- (3) Explain guayule and balata rubber.
- (4) Enlist various drawbacks of raw rubber.
- (5) Describe in brief about rubber hose.
- (6) Explain the role of antidegradent in rubber compounding.
- (7) Explain the role of reinforcing agents and peptizes in rubber compounding.
- (8) Draw flow diagram of SBR manufacturing.
- (9) Explain the various methods used for production of acetylene black.

- Q. 3** (a) Give an account on natural rubber plantation, tapping, preservation and coagulation of latex. 06  
(b) Write a note on following. 06  
1. Cyclised rubber  
2. Chemically modified forms of natural rubber

**OR**

- (b) Answer following. 06  
1. Enlist characteristics of rubber  
2. Describe ribbed smoked sheet.
- Q. 4** (a) Give an account on synthetic polyisoprene rubber with suitable flow diagram. 06  
(b) Describe following. 06  
1. EPDM rubber.  
2. Silicone rubber.

**OR**

- (b) Explain in detail about solvent resistant elastomers. 06
- Q. 5** (a) Discuss the role of peroxide in rubber compounding. Enlist various advantages of peroxide vulcanisation. 06  
(b) Explain in brief about any three vulcanizing accelerators. 06

**OR**

- (b) Write a detail note on various plasticisers and softners used for rubber compounding. 06
- Q. 6** (a) How conveyer and V-belts are manufactured? Explain. 06  
(b) Describe in detail about thermal black method for carbon black manufacturing 06

**OR**

- (b) Explain sulphur and non – sulphur vulcanization. 06

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M.Sc. (Polymer Science & Technology) Semester-III Examination-2017

Monday, 06<sup>th</sup> November 2017

2:00 P.M. to 5:00 P.M.

PS03CPST10: POLYMER COMPOSITES & FIBER TECHNOLOGY

Total Marks: 70

Note: (1) Attempt all questions.

(2) Figures to the right indicate full marks.

Q.1

Multiple choice questions.

(08)

- (1) \_\_\_\_\_ is an unsaturated monomer for unsaturated polyester resin  
(a) Formic acid (b) maleic anhydride (c) Lactic acid (d) all of these
- (2) \_\_\_\_\_ is act as accelerator in curing of unsaturated polyester resin  
(a) Benzoyl Peroxide (b) Hydroperoxide (c) Cobalt Octate (d) None of these
- (3) Unidirectional carbon fiber reinforced epoxides provides a specific modulus that is approximately \_\_\_\_\_ times higher than that of steel.  
(a) 2 to 3 (b) 3.5 to 5 (c) 1 to 2.5 (d) none of these
- (4) Which is the reactive diluents in epoxy resin  
(a) pine oil (b) benzyl alcohol (c) toluene (d) none of these
- (5) Which is the first stage in curing of polyester resin  
(a) Hardening (b) Gelation (c) maturing (d) none of these
- (6) \_\_\_\_\_ type of monomer act as a solvent and to crosslink the polymer chain in unsaturated polyester resin  
(a) Toluene (b) Xylene (c) styrene (d) None of these
- (7) Which monomer improves chemical resistance and hydrolytic stability in polyester resin?  
(a) propylene glycol (b) neopentyl glycol (c) maleic acid (d) styrene
- (8) In polyester resin curing system, If cobalt naphthenate and dimethyl aniline is added so gel time of resin is \_\_\_\_\_  
(a) Decrease (b) Increase (c) No Change (d) none of these

**Q.2 Answer the following (any seven) (14)**

- (1) Write a note on wooden mould.
- (2) Which are three different stages for curing of polyester resin? Explain it.
- (3) Discuss the advantage and disadvantage of composite
- (4) Explain the role of inhibitor in unsaturated polyester resin
- (5) How to calculate Amount of hardner needed for 250 gm of epoxy resin. We can use epoxy equivalent weight = 200 , and hardner used is Triethylene tetraamine
- (6) Write a note on plaster mould
- (7) Define composite. Give the classification of composite based on reinforcement material.
- (8) Write the mechanism of epoxy resin formation.
- (9) Explain the amine based curing system in epoxide resin

**Q.3 (a) Write the factor affecting the material selection and process selection in designing of FRP. (06)**

**(b) Write a note on two stage casting of epoxide resin mould. (06)**

**OR**

**(b) Write a note on matching mould (06)**

**Q.4 (a) Explain the anhydride curing reaction of epoxide resin (06)**

**(b) Explain the significance of saturated acid, unsaturated acid and glycol in unsaturated polyester resin. (06)**

**OR**

**(b) Explain gelcoat, top coat and low shrink unsaturated polyester resin (06)**

**Q.5 (a) Write a note on carbon fiber production process with diagram. (06)**

**(b) Discuss the glass fiber production process and explain its properties (06)**

**OR**

**(b) Write a short note on aramid fiber. Explain Nomex and Kevlar fiber with its synthesis scheme and properties (06)**

**Q.6 (a) Explain hand lay- up and spray lay-up technique. (06)**

**(b) Discuss the resin injection moulding process (06)**

**OR**

**(b) Write a note on (06)**

**(i) Foam reservoir moulding**

**(ii) Pultrusion**

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# SARDAR PATEL UNIVERSITY

M.Sc. Polymer Science & Technology Semester-III Examination – 2017

Wednesday, 08<sup>th</sup> November 2017

02:00 p.m. to 5:00 p.m.

## PS03CPST11: PETROCHEMICALS

**Note:** (1) Attempt all questions  
(2) Figures to the right indicates full marks

**TOTAL MARKS: 70**

**Q.1 Multiple choice questions.**

**(08)**

- (1) In petrochemical Industry, \_\_\_\_\_ compounds are known as naphthenes  
(a) Alkane (b) cycloalkane (c) aromatic (d) olefins
- (2) Non catalytic gas phase reactions are carried out in \_\_\_\_\_ reactor  
(a) Adiabatic (b) Tabular (c) Fluidised bed reactor (d) Stirred flow reactor
- (3) \_\_\_\_\_ is the example of non basic nitrogen compound  
(a) Pyrrole (b) porphirins (c) Indole (d) All of these
- (4) \_\_\_\_\_ is the example of acidic sulphur compound  
(a) Dimethyl sulfide (b) Thiosyclohexane (c) Thiophene (d) None of these
- (5) \_\_\_\_\_ is known as Isohexane  
(a) 2,2 – dimethyl butane (b) 2,3 -dimethylbutane (c) 3- methylpentane (d) 2-methyl pentane
- (6) In the butadiene production from acetylene and formaldehyde \_\_\_\_\_ is used as catalyst in the vapour phase  
(a) Zinc oxide (b) Copper Acetylide (c) Magnesia & Chromium (d) Platinum
- (7) Thermal cracking reaction mechanism are carried out by \_\_\_\_\_  
(a) Anionic (b) Cationic (c) Free radical (d) None of these
- (8) Steam to hydrocarbon weight ratio for olefin production is \_\_\_\_\_ for ethane feeds  
(a) 0.2 – 1.0 (b) 0.4 – 0.6 (c) 0.8 – 1.0 (d) 1.0 – 1.2

**Q.2 Answer any seven of following.**

**(14)**

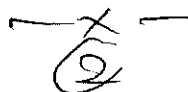
- (1) Discuss the production and uses of formaldehyde
- (2) Why petroleum refining is required? Write different fractions from distillation of crude oil

(1)

(P.T.O)

- (3) How the internal combustion engines work?
- (4) What is octane number? Discuss the additives used in petrol manufacture
- (5) Discuss the Isomerisation process
- (6) Write a note on viscosity breaking process
- (7) Write a note on maleic anhydride production
- (8) Discuss the different fractions of natural gas liquid (NGL) and write the properties of natural gas liquids.
- (9) What are the different costing parameters in petrochemical processing? Explain
- Q.3** (a) Explain the petrochemical process technology with schematic flow diagram which is used in continuous processing of styrene (06)
- (b) Which type of distillation is used in crude oil processing? Explain it (06)
- OR**
- (b) Which type of reactor used in petrochemical process technology? Explain it (06)
- Q.4** (a) Discuss the production of ethylene with diagram from ethane in steam cracking process and What are the different process variable in steam cracking process? Explain (06)
- (b) Why natural gas required treatment process? Explain the acid gas treatment process (06)
- OR**
- (b) What are the compositions of crude oil? Explain it (06)
- Q.5** (a) Which are the different routes for the production of Isoprene? Explain it (06)
- (b) Which are the different routes for the production of butadiene? Explain it (06)
- OR**
- (b) What is coking process? Explain delayed and fluid coking process (06)
- Q.6** (a) Explain the production of urea and ammonia (06)
- (b) Write a synthesis scheme of phenol with its properties and application (06)
- OR**
- (b) Discuss the production of methanol and acetic acid (06)

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# SARDAR PATEL UNIVERSITY

M.Sc. (Polymer Science & Technology) Semester-III Examination-2017

Friday, 10<sup>th</sup> November-2017

2:00 P.M. to 5:00 P.M.

## PS03EPST05: ENVIRONMENTAL CHEMISTRY

Total Marks: 70

- Note:** (1) Attempt all questions.  
(2) Figures to the right indicate marks.

**Q. 1** Answer the following multiple choice questions. 08

- (1) Pressure drops from 1 atmosphere at sea level to \_\_\_\_\_ atmosphere at 100 km above sea level.  
(i)  $3 \times 10^{-7}$  (ii)  $300 \times 10^{-9}$  (iii)  $0.03 \times 10^{-5}$  (iv) all of above.
- (2) \_\_\_\_\_ is the outer most concentric layer of the earth.  
(i) Inner core (ii) Outer core (iii) Mantle (iv) None of above.
- (3) According to \_\_\_\_\_, human population explosion is the main cause of pollution.  
(i) Quartz (ii) Southwick (iii) Mohr (iv) none of above
- (4) In El Nino, a trade wind blows from \_\_\_\_\_.  
(i) south to east (ii) east to south (iii) west to east (iv) east to west.
- (5) Winkler's method is used to measure \_\_\_\_\_ content in water.  
(i)  $SO_x$  (ii) DO (iii) chloride (iv) none of above.
- (6) \_\_\_\_\_ is responsible for inorganic water pollution.  
(i) Detergents (ii) Organometallic compound (iii) Acid mine drainage  
(iv) All of above.
- (7) The average paper content in the refuse of Indian cities is \_\_\_\_\_ as compared to European city.  
(i) high (ii) less (iii) equal (iv) none of above
- (8) Classification of wastes can be done based on \_\_\_\_\_.  
(i) content (ii) heating value (iii) moisture content (iv) all of above

**Q. 2** Attempt **any seven** of the following. 14

- (1) Write a brief note on various types of rocks.
- (2) Write down an importance of NPK as nutrients in soil.
- (3) How do hydrocarbon air pollutants can be measured?
- (4) Classify pollutant based on their forms they exist in the environment.
- (5) Write a brief note on concentration window.

- (6) Describe West-Gaeke method.
- (7) Explain Mohr's method.
- (8) Write down recovery and recycling of glass waste.
- (9) Explain various collection methods for the solid waste.
- Q. 3** (a) What do you mean by endogenic and exogenic cycles. Explain hydrological cycle in detail. 06
- (b) Write a note on below. 06
- (1) Nitrogen cycle.
- (2) Weathering processes.
- OR**
- (b) Give an account on ecology and eco system with suitable examples. 06
- Q. 4** (a) Discuss in detail about greenhouse effect. 06
- (b) Answer the following. 06
- (1) Analysis of NO<sub>x</sub> air pollutants.
- (2) Analysis of CO air pollutant.
- OR**
- (b) Define secondary pollutant. Explain its source and formation cycle in detail. 06
- Q. 5** (a) How do insecticides kill the target insects? Explain its mechanism and magnification of DDT in food chain. 06
- (b) Write a note on following. 06
- (1) Radioactive water pollutants.
- (2) COD.
- OR**
- (b) Explain following in detail. 06
- (1) BOD.
- (2) Organic water pollutants.
- Q. 6** (a) Write a detail note on Composting. 06
- (b) Discuss following. 06
- (1) Sanitary landfill.
- (2) Recovery and recycling of metals.
- OR**
- (b) Give an account on following. 06
- (1) Incineration.
- (2) Green chemistry.

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